SBCs as a Dynamic Commitment Problem: an Explanatory Note

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This note gives a brief explanation of the model by Dewatripont and Maskin (1995). A plethora of models have evolved around the basic idea set out in the above mentioned paper, but we will focus on the main ideas.

The model is a game-theoretical model, which means that we study the behaviour of economic agents, when (strategically) interacting with each other (cfr. playing chess is about anticipating strategies of your opponent). This as opposed to neo-classical economic theory which focuses on the behaviour of one economic agent e.g. one utility maximising consumer decides over consumption, one enterpreneur maximises profits and chooses production or prices accordingly.

The structure of the model is as follows (a graphical representation of the game is presented in Figure 1):

- There are 2 time periods: 1 and 2
- There are 2 players: an enterpreneur (E) and the government (G)
- We make a number of (simplifying) assumptions. One of them is that the G provides bank financing to projects (i.e. banks are state-owned). We also assume that the G has a broad welfare function, in that it not only cares about taxes received, but it cares about the pay-offs or benefits to all economic agents in the country (i.e. the G and the E). Other assumptions are explained later onwards.
- According to Nature (paraphrasing how things turn out in reality), the distribution of quality of projects is that with a chance α projects are good, and with a chance $1 - \alpha$, projects are of bad quality. The distribution is known to all the players of the game (i.e. E and G), but there is asymmetric information as to the particular type of project that will have to be decided upon.
- The E sees the opportunity for some business project, for a new strategy, ... and he knows whether the project is going to be successful or not, i.e. the quality of the particular project that comes to the mind of the E is known to the E. The E now has to decide whether he goes ahead with this project or not, i.e. he decides whether or not to submit (S) this project

with the government for financing. In case E decides not to S the project, the return of this strategy to the government (possible income through taxes) is 0, and the private gain to the E is also 0. We denote this with (0,0). The first 0 refers to the pay-offs to the G, the second number to the pay-offs to the E. In case E decides to S the project, we arrive at the problem of the second player in the game, i.e. the G

- The G now has to decide whether or not to finance (F) this submitted project. Remember there is asymmetric information: the government knows the general distribution of projects' quality, but cannot infer the quality of the particular project that is submitted by E. Therefore, G will finance the project if

$$\begin{aligned} & \alpha(pay-off\ to\ G\ if\ project\ is\ good) \\ & +(1-\alpha)(pay-off\ to\ G\ if\ project\ is\ bad) \\ \geqslant\ & 0 \end{aligned}$$

  Suppose indeed that the above condition holds, the G finances the project, and bears a cost of financing equal to -1.

- Now, at the end of period 1 (e.g. when first interest payments are due), the quality of the project is revealed to the G (e.g. the G is confronted with the fact whether or not E is able to pay interest payments). In case the project turns out to be good, the returns are (R_g, B_g) where we assume that $R_g > 1, B_g > 0$. The government thus has a net benefit from financing a good project equal to $R_g - 1 > 0$, whereas the E enjoys a return of $B_g > 0$. In case the project turns out to be bad, there is no taxable return to the government, such that its net pay-off equals -1. Knowing the project is bad, the G might want to liquidate the project, withholding any further financial support to the project. Liquidation yields as pay-offs (L, B_l) wherethe liquidation value of the assets of the firm yield $L \geqslant 0$ to G and where $B_l < 0$ (e.g. liquidation is perceived as a loss of prestige to the E). Notice that the E will not like this option!

- However, the G has the possibility to refinance (reF) the project in period 2. This comes at a monetary cost -1 to the G, but yields (R_p, B_p) where we assume that $1 < R_p + B_p < 2$ and where $B_p > 0$ (e.g. there is some prestige if the E can continue his project).

Several questions need to be answered:

- Is G going to F the project (of unknown quality)?
- Is G going to reF the project once it turns out to be of poor quality?
- Is E going to S a good project? Is E going to S a bad project?

We answer these questions accordingly:

- As before, G is going to F a project in case

$$\begin{aligned} & \alpha(pay-off\ to\ G\ if\ project\ is\ good) \\ & +(1-\alpha)(pay-off\ to\ G\ if\ project\ is\ bad) \\ \geqslant\ & 0 \end{aligned}$$

  Since we now know the structure of the game, this condition is

$$\alpha(R_g + B_g - 1) + (1-\alpha)\max(R_p + B_p - 2; L + B_l - 1) \geqslant 0$$

  This condition is satisfied (suppose $R_p + B_p - 2 > L + B_l - 1$) if

$$\alpha \geqslant \alpha^* = \frac{2 - R_p - B_p}{R_g + B_g - R_p - B_p + 1}$$

  i.e. if there is a sufficiently large amount of good projects.

- However, G is going to anticipate its decision in period 2 over reF when the first F-decision takes place (cfr. earlier, the max-operator). ReF is going to take place in case

$$R_p + B_p - 2 > L + B_l - 1$$

  i.e. when reF is indeed beneficial to the G. Notice that to E, refinancing is always beneficial, since $B_p > 0 > B_l$.

- E is always going to S a good project (E knows the project's quality!), since $B_g > 0$

- E is going to S a bad project if $R_p + B_p - 2 > L + B_l - 1$. In this case, reF is expected, and thus a pay-off equal to $B_p > 0$. Suppose $R_p + B_p - 2 < L + B_l - 1$, liquidation is expected and thus a return $B_l < 0$, which is worse than a zero return when no S takes place.

Conclusion:

If $R_p + B_p - 2 > L + B_l - 1$, bad projects - the E knows the project is bad - are still S to G for funding. When there is a sufficiently high chance the project might be good (but in this case it isn't), the G funds the project and is subsequently forced to reF it. This is bad for overall welfare as $R_p + B_p < 2$. It should be clear that since $R_p + B_p > 1$, there is a commitment problem for the G not to reF the bad project. It aims to retrieve some of the funds after having made a sunk cost. This is what we call - in the tradition of the DM literature - a case where there is an incentive for a SBC.

Dewatripont M. and E.S. Maskin (1995), Credit Efficiency in Centralized and Decentralized Economies, *Review of Economic Studies*, Vol. 62, p. 541-55.